

## ? Topic Essential Question

What does it mean to solve a system of linear equations?

## Vocabulary Review

Complete each definition and then provide an example of each vocabulary word.

**Vocabulary** solution of a system of linear equations  
system of linear equations

| Definition  | Example |
|---|---------|
| Any ordered pair that makes all equations in the system true is a<br><input type="text"/>     |         |
| A <input type="text"/> is formed by two or more linear equations that use the same variables. |         |

### Use Vocabulary in Writing

Describe how you can find the number of solutions of two or more equations by using the slope and the  $y$ -intercept. Use vocabulary terms in your description.

# Concepts and Skills Review

## LESSON 5-1 Estimate Solutions by Inspection

### Quick Review

The slopes and  $y$ -intercepts of the linear equations in a system determine the relationship between the lines and the number of solutions.

|                           | Same Slope? | Same $y$ -intercept? |
|---------------------------|-------------|----------------------|
| No Solution               | Yes         | No                   |
| One Solution              | No          | n/a                  |
| Infinitely Many Solutions | Yes         | Yes                  |

### Example

How many solutions does the system of equations have? Explain.

$$y + 2x = 6$$

$$y - 8 = -2x$$

Write each equation in slope-intercept form.

$$y = -2x + 6$$

$$y = -2x + 8$$

Identify the slope and  $y$ -intercept of each equation.

For the equation  $y = -2x + 6$ , the slope is  $-2$  and the  $y$ -intercept is  $6$ .

For the equation  $y = -2x + 8$ , the slope is  $-2$  and the  $y$ -intercept is  $8$ .

The equations have the same slope but different  $y$ -intercepts, so the system has no solution.

### Practice

Determine whether the system of equations has one solution, no solution, or infinitely many solutions.

1.  $y - 13 = 5x$

$$y - 5x = 12$$

2.  $y = 2x + 10$

$$3y - 6x = 30$$

3.  $-3x + \frac{1}{3}y = 12$

$$2y = 18x + 72$$

4.  $y - \frac{1}{4}x = -1$

$$y - 2 = 4x$$

5. Michael and Ashley each buy  $x$  pounds of turkey and  $y$  pounds of ham. Turkey costs \$3 per pound at Store A and \$4.50 per pound at Store B. Ham costs \$4 per pound at Store A and \$6 per pound at Store B. Michael spends \$18 at Store A, and Ashley spends \$27 at Store B. Could Michael and Ashley have bought the same amount of turkey and ham? Explain.





## Quick Review

Systems of equations can be solved by looking at their graphs. A system with one solution has one point of intersection. A system with infinitely many solutions has infinite points of intersection. A system with no solution has no points of intersection.

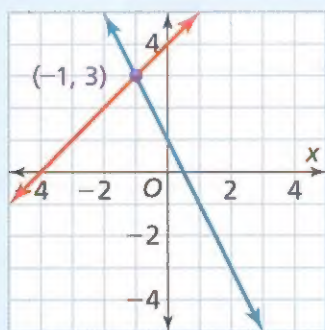
## Example

Graph the system and determine its solution.

$$y = x + 4$$

$$y = -2x + 1$$

Graph each equation in the system on the same coordinate plane.



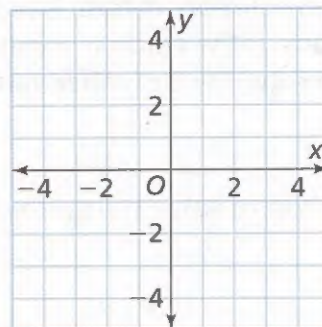
The point of intersection is  $(-1, 3)$ . This means the solution to the system is  $(-1, 3)$ .

## Practice

Graph each system and find the solution(s).

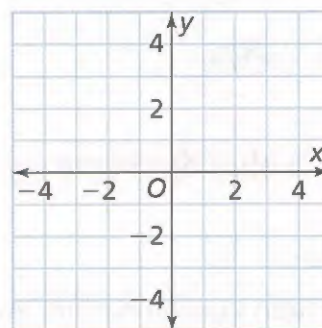
1.  $y = \frac{1}{2}x + 1$

$$-2x + 4y = 4$$



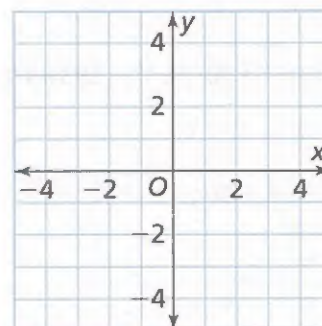
2.  $y = -x - 3$

$$y + x = 2$$



3.  $2y = 6x + 4$

$$y = -2x + 2$$



**LESSON 5-3** Solve Systems by Substitution**Quick Review**

To solve a system by substitution, write one equation for a variable in terms of the other. Substitute the expression into the other equation and solve. If the result is false, the system has no solution. If true, it has infinitely many solutions. If the result is a value, substitute to solve for the other variable.

**Example**

Use substitution to solve the system.

$$y = x + 1$$

$$y = 5x - 3$$

Substitute  $x + 1$  for  $y$  in the second equation.

$$(x + 1) = 5x - 3$$

$$4 = 4x$$

$$1 = x$$

Substitute 1 for  $x$  in the first equation.

$$y = (1) + 1 = 2$$

The solution is  $x = 1, y = 2$ .

**Practice**

Use substitution to solve each system.

1.  $-3y = -2x - 1$

$$y = x - 1$$

2.  $y = 5x + 2$

$$2y - 4 = 10x$$

3.  $2y - 8 = 6x$

$$y = 3x + 2$$

4.  $2y - 2 = 4x$

$$y = -x + 4$$

**LESSON 5-4** Solve Systems by Elimination**Quick Review**

To solve a system by elimination, multiply one or both equations to make opposite terms. Add (or subtract) the equations to eliminate one variable. Substitute to solve for the other variable.

**Example**

Use elimination to solve the system.

$$2x - 9y = -5$$

$$4x - 6y = 2$$

Multiply the first equation by  $-2$ . Then add.

$$-4x + 18y = 10$$

$$\begin{array}{r} 4x - 6y = 2 \\ -4x + 18y = 10 \\ \hline 12y = 12 \\ y = 1 \end{array}$$

Substitute 1 for  $y$  in the first equation.

$$2x - 9(1) = -5$$

$$2x - 9 = -5$$

$$2x = 4$$

$$x = 2$$

The solution is  $x = 2, y = 1$ .

**Practice**

Use elimination to solve each system.

1.  $-2x + 2y = 2$

$$4x - 4y = 4$$

2.  $4x + 6y = 40$

$$-2x + y = 4$$

3. A customer at a concession stand bought 2 boxes of popcorn and 3 drinks for \$12. Another customer bought 3 boxes of popcorn and 5 drinks for \$19. How much does a box of popcorn cost? How much does a drink cost?





# Pathfinder

Shade a path from START to FINISH. Follow the solutions to the equations from least to greatest. You can only move up, down, right, or left.

**I can...**

solve multistep equations using the Distributive Property.

**START**



$$\begin{aligned} 2(d + 1) \\ = -38 \end{aligned}$$

$$\begin{aligned} 3(2z + 3) \\ = -75 \end{aligned}$$

$$3(g + 4) = g$$

$$\begin{aligned} -2(t - 1) + 8 \\ = 30 \end{aligned}$$

$$\begin{aligned} 7x - 2(x - 11) \\ = -103 \end{aligned}$$

$$\begin{aligned} 2(s + 6) \\ = 5(s + 12) \end{aligned}$$

$$4(w - 7) = -48$$

$$\begin{aligned} 6m + 3(4m + 18) \\ = -108 \end{aligned}$$

$$\begin{aligned} 2w - 5(w + 4) \\ = -14 \end{aligned}$$

$$\begin{aligned} 3c + 2(2c + 5) \\ = 3 \end{aligned}$$

$$2(q - 6) = -18$$

$$6 - 9(r - 3) = 69$$

$$-4(h - 2) = 8$$

$$\begin{aligned} 2.5n + 1.1 \\ = 4n - 1.9 \end{aligned}$$

$$-17 = \frac{1}{3}(9y + 12)$$

$$4a - 11 = a - 5$$

$$4(3 - 5k) = 92$$

$$\begin{aligned} -4(-2j + 7) \\ = -4 \end{aligned}$$

$$\begin{aligned} 9b - 10 \\ = 2(3b + 4) \end{aligned}$$

$$\begin{aligned} 12(7 - 2v) + 5v \\ = -68 \end{aligned}$$



**FINISH**

